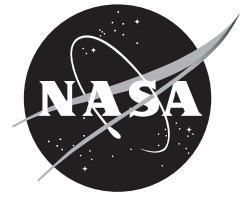


NASA Facts

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Spinoffs from The Space Shuttle Program

NASA technology touches the lives of Americans everyday in a variety of ways. More than 1,300 documented NASA technologies have benefited U.S. industry, improved our quality of life, and created jobs for Americans. The Space Shuttle program alone has generated more than 100 technology spinoffs. Some of the Shuttle's contributions are:

- **Artificial Heart**—The technology used in Space Shuttle fuel pumps led to the development of a miniaturized ventricular assist pump by NASA and renowned heart surgeon Dr. Michael DeBakey. The tiny pump—two inches long, one inch in diameter and weighing less than four ounces—is currently undergoing European clinical trials where it has been successfully implanted into more than 20 people.
- **Automotive Insulation**—Materials from the Space Shuttle thermal protection system are used on NASCAR racing cars to protect drivers from the extreme heat generated by the engines.
- **Balance Evaluation Systems**—Devices built to measure the equilibrium of Space Shuttle astronauts when they return from space are widely used by major medical centers to diagnose and treat patients suffering head injury, stroke, chronic dizziness and central nervous system disorders.
- **Bioreactor**—Developed for Space Shuttle medical research, this rotating cell culture apparatus simulates some aspects of the space environment, or microgravity, on the ground. Tissue samples grown in the bioreactor are being used to design therapeutic drugs and antibodies. Some scientists believe the bioreactor will routinely produce human tissue for research and transplantation.
- **Diagnostic Instrument**—NASA technology was used to create a compact laboratory instrument for hospitals and doctors' offices that more quickly analyzes blood, accomplishing in 30 seconds what once took 20 minutes.
- **Gas Detector**—A gas leak detection system, originally developed to monitor the Shuttle's hydrogen propulsion system, is being used by the Ford Motor Company in the production of a natural gas-powered car.
- **Infrared Camera**—A sensitive infrared hand-held camera that observes the blazing plumes from the Shuttle also is capable of scanning for fires. During the brush fires that ravaged Malibu, CA in 1996, the camera was used to point out hot spots for firefighters.
- **Infrared Thermometer**—Infrared sensors developed to remotely measure the temperature of distant stars and planets, led to the development of the hand-held optical sensor thermometer. Placed inside the ear canal, the thermometer provides an accurate reading in two seconds or less.
- **Jewelry Design**—Jewelers no longer have to worry about inhaling dangerous asbestos fibers from the blocks they use as soldering bases. Space Shuttle heat shield tiles offer jewelers a safer soldering base with temperature resistance far beyond the 1,400 degrees Fahrenheit generated by the jeweler's torch.
- **Land Mine Removal Device**—The same rocket fuel that helps launch the Space Shuttle is now being used to save lives — by destroying land mines. A flare device, using left-over fuel donated by NASA, is placed next to the uncovered land mine and is ignited from a safe distance using a battery-triggered electric match. The explosive burns away, disabling the mine and rendering it harmless.
- **Lifesaving Light**—Special lighting technology developed for plant growth experiments on Space Shuttle missions is now used to treat brain tumors in children. Doctors at the Medical College of Wisconsin in Milwaukee use light emitting diodes in a treatment called photodynamic therapy, a form of chemotherapy, to kill cancerous tumors.

- **Prosthesis Material**—Responding to a request from the orthopedic appliance industry, NASA recommended that the foam insulation used to protect the Shuttle’s external tank replace the heavy, fragile plaster used to produce master molds for prosthetics. The new material is light, virtually indestructible and easy to ship and store.
- **Rescue Tool**—Rescue squads have a new extrication tool to help remove accident victims from wrecked vehicles. The hand-held device requires no auxiliary power systems or cumbersome hoses and is 70 percent cheaper than previous rescue equipment. The cutter uses a miniature version of the explosive charges that separate devices on the Shuttle.
- **Vehicle Tracking System**—Tracking information originally used onboard Space Shuttle missions now helps track vehicles on Earth. This commercial spinoff allows vehicles to transmit a signal back to a home base. Municipalities today use the software to track and reassign emergency and public works vehicles. It also is used by vehicle fleet operations, such as taxis, armored cars, and vehicles carrying hazardous cargo.
- **Video Stabilization Software**—Image-processing technology used to analyze Space Shuttle launch video and to study meteorological images also helps law enforcement agencies improve crime-solving video. The technology removes defects due to image jitter, image rotation, and image zoom in video sequences. The technology also may be useful for medical imaging, scientific applications, and home video.

For more information on NASA Spinoffs, please refer to our Web site at: ***<http://nctn.hq.nasa.gov/success/index.html>***